

Lead in Construction



U.S. Department of Labor
Occupational Safety and Health Administration

OSHA 3142
1993

Material contained in this publication is in the public domain and may be reproduced, fully or partially, without permission of the Federal Government. Source credit is requested but not required.

The information contained in this publication is not considered a substitute for any provisions of the Occupational Safety and Health Act of 1970 or for any standards issued by OSHA.

The information will be made available to sensory impaired individuals upon request.

Voice phone: 202-219-8615;

Telecommunications Device for the Deaf (TDD)
message referral phone: 1-800-326-2577.

24-Hour OSHA Hotline: 1-800-321-OSHA.

(To report suspected fire hazards, imminent danger safety and health hazards in the workplace, or other job safety and health emergencies.)

Lead in Construction



U.S. Department of Labor
Robert B. Reich, Secretary

Occupational Safety and Health Administration

OSHA 3142
1993

Contents

	Page
Background	1
Health Hazards of Lead Exposure	1
Scope and Application	3
Provisions of the Standard	3
Permissible Exposure Limit	4
Action Level	4
Exposure Monitoring and Medical Surveillance	4
Information and Training	11
Methods of Compliance	12
Compliance Program	12
Engineering, Work Practice, and Administrative Controls	13
Respirators	15
Protective Clothing and Equipment	17
Recordkeeping	18
Other Sources of OSHA Assistance	19
Safety and Health Management Guidelines	19
State Programs	20
Consultation Services	20
Voluntary Protection Programs (VPP)	21
Training and Education	21
Related OSHA Publications	22
States with Approved Plans	23
OSHA Consultation Project Directory	26
OSHA Area Offices	28

Background

Although Occupational Safety and Health Administration (OSHA) regulations for occupational lead exposure have been in effect since 1971 for the construction and general industries, the agency recognized the need to provide better protection and revised the regulations for general industry in 1978. The 1978 lead standard, however, excluded the construction industry from coverage because of insufficient information regarding lead use in construction.

In 1990, the National Institute for Occupational Safety and Health (NIOSH) set a national goal to eliminate worker exposures resulting in blood lead concentrations greater than 25 micrograms per deciliter (25 µg/dl) of whole blood. Consequently, OSHA began developing a proposal for a comprehensive standard regulating occupational exposure to lead in construction. In October 1992, the Congress passed Section 1031 of Title X of the Housing and Community Development Act of 1992 (P.L. 102-550) requiring OSHA to issue an interim final lead standard for the construction industry, effective until OSHA issues a final standard.

The interim final rule, published on May 4, 1993,¹ amends the OSHA standards for occupational health and environmental controls in Subpart D of Title 29 *Code of Federal Regulations* (CFR) 1926 by adding a new section 1926.62, containing employee protection requirements for construction workers exposed to lead.

Health Hazards of Lead Exposure

Pure lead (Pb) is a heavy metal (at room temperature and pressure) and is a basic chemical element. It can combine with various other substances to form numerous lead compounds.

When absorbed into the body in certain doses lead is toxic. It can be absorbed into the body by inhalation and ingestion. Except for certain organic lead compounds not covered by this standard, lead is not absorbed significantly through the skin. When scattered through the air as a dust, fume, or mist, lead can be inhaled and absorbed through the lungs and upper respiratory tract. Inhalation of airborne lead is generally the most important source of occupational lead absorption. Lead also can be absorbed through the digestive system if it enters the mouth and is ingested.

¹*Federal Register* 58(84):26590-26649, May 4, 1993.

A significant portion of the lead inhaled or ingested gets into the blood stream. Once in the blood stream, lead is circulated through the body and stored in various organs and body tissues. Some of this lead is quickly filtered out of the body and excreted, but some remains in the blood and tissues. As exposure continues, the amount stored will increase if the body is absorbing more lead than it is excreting. The lead stored in the tissues can slowly cause irreversible damage, first to individual cells, then to organs and whole body systems.

Lead adversely affects numerous body systems and causes forms of health impairment and disease that arise after periods of exposure as short as days (acute exposure) or as long as several years (chronic overexposure). A short-term dose of lead exposure can lead to acute encephalopathy, a condition affecting the brain that develops quickly into seizures, coma, and death from cardiorespiratory arrest. Short-term occupational exposures of this type are highly unusual, but not impossible. Similar forms of encephalopathy, however, may arise from extended chronic exposure to lower doses of lead. Consequently, there is no sharp distinction between rapidly developing acute effects of lead and longer term chronic effects.

Long-term (chronic) overexposure to lead may result in severe damage to the blood-forming, nervous, urinary, and reproductive systems. Some common symptoms include the following:

loss of appetite	metallic taste in the	anxiety
constipation	mouth	pallor
excessive tiredness	weakness	insomnia
headache	nervous irritability	numbness
fine tremors	hyperactivity	dizziness
colic with severe	muscle and joint pain	
abdominal pain	or soreness	

Damage to the central nervous system in general and the brain in particular is one of the most severe forms of lead poisoning. Chronic overexposure to lead also significantly impairs the reproductive systems of both men and women. Lead can alter the structure of sperm cells—raising the risk of birth defects—and there is evidence of miscarriage and stillbirth in women exposed to lead or whose husbands have been exposed to lead. Children born of parents who

were exposed to excess lead levels are more likely to have birth defects, mental retardation, behavioral disorders, or to die during the first year of childhood.

The interim OSHA standard aims to reduce the exposure to lead for construction workers. The most significant way to achieve this is by lowering the permissible exposure limit (PEL) from 200 micrograms per cubic meter of air ($200 \mu\text{g}/\text{m}^3$) as an 8-hour time weighted average (TWA) to $50 \mu\text{g}/\text{m}^3$.

Scope and Application

For the purpose of this standard, lead includes metallic lead, all inorganic lead compounds, and organic lead soaps.

OSHA's lead in construction standard applies to all construction work where an employee may be occupationally exposed to lead. All work related to construction, alteration, or repair—including painting and decorating—is included. Under this standard, construction includes, but is not limited to, the following:

- demolition or salvage of structures where lead or materials containing lead are present;
- removal or encapsulation of materials containing lead;
- new construction, alteration, repair, or renovation of structures, substrates, or portions containing lead, or materials containing lead;
- installation of products containing lead;
- lead contamination from emergency cleanup;
- transportation, disposal, storage, or containment of lead or materials containing lead on the site or location at which construction activities are performed; and
- maintenance operations associated with construction activities described above.

Provisions of the Standard

The standard establishes maximum limits of exposure to lead for all workers covered, including a permissible exposure limit and action level.

Permissible Exposure Limit

The permissible exposure limit, or PEL, sets the maximum worker exposure to lead. For example, no employee may be exposed to lead at airborne concentrations greater than $50 \mu\text{g}/\text{m}^3$ averaged over an 8-hour period. If employees are exposed to lead for more than 8 hours in any workday, the following formula must be used to reduce exposure as a TWA:

Employee exposure (in $\mu\text{g}/\text{m}^3$) = 400 divided by hours worked in the day.²

Action Level

An action level is the level at which an employer must begin certain compliance activities outlined in the standard. The action level, regardless of respirator use, for the lead in construction standard is an airborne concentration of $30 \mu\text{g}/\text{m}^3$ calculated as an 8-hour TWA.

Exposure Monitoring and Medical Surveillance

Assessing Exposures

Where initial employee exposure³ is at or above the action level, the employer must collect personal samples representative of a full work shift, including at least one sample for each shift or for the shift with the highest exposure level for each job classification in each work area. These samples must represent the monitored employee's **regular, daily exposure** to lead. Measurements made within the previous 12 months also may be used to determine how far above the action level employee exposure may be.

An initial determination of whether employees are exposed to lead at or above the action level and the results of that determination must be made available based on the following:

²When respirators are used to limit employee exposure to lead, the measured exposure can be considered at the level provided by the protection factor of the respirator for those periods worn. Those periods may be averaged with exposure levels during periods when respirators are not worn to determine the employee's daily TWA exposure.

³For the purpose of this section, exposure is considered to be the level occurring if the employee were not using a respirator.

- any information, observation, or calculation that indicates employee exposure to lead;
- any previous measurements of airborne lead;
- any employee complaints of symptoms attributable to lead exposure; and
- objective data regarding materials, processes, or operations.

The employer may discontinue required monitoring when at least two consecutive measurements—taken at least 7 days apart—are below the action level.

Monitoring for the initial determination whether employers are exposed at or above the action level may be limited to a representative sample of those employees exposed to the greatest concentrations of airborne lead. Measurements made within the preceding 12 months, which were performed by the same employer and applicable to the same employee tasks, may be used.

The employer must establish and maintain an accurate record documenting the nature and relevancy of previous exposure data. Instead of performing initial monitoring, the employer may rely on objective data that demonstrate that a particular lead-containing material or product does not result in employee exposure at or above the action level when processing, using, or handling.

Until the employer performs an exposure assessment and documents that employees are not exposed above the PEL, the employer must treat employees performing certain operations as if they were exposed above the PEL. This means providing respiratory protection, protective work clothing and equipment, change areas, hand washing facilities, biological monitoring, and training—as required by the standard—for the following tasks:

- manual demolition of structures (e.g., dry wall), manual scraping, manual sanding, and use of heat gun where lead-containing coatings or paints are present;
- abrasive blasting enclosure movement and removal;
- power tool cleaning;
- lead burning;
- using lead-containing mortar or spray painting with lead-containing paint;
- abrasive blasting, rivet busting, or welding, cutting, or burning on any structure where lead-containing coatings or paint are present;

- cleanup activities where dry expendable abrasives are used; and
- any other task the employer believes may cause exposures in excess of the PEL.

For an initial determination that indicates no employee is exposed at or above the action level ($30 \mu\text{g}/\text{m}^3$), the employer must keep a written record of the determination, including the date, location within the work site, and the name and social security number of each monitored employee. (See "Recordkeeping" section elsewhere in this publication for more information.)

Monitoring and Observing

If the initial determination proves employee exposure is below the action level, further exposure determination need not be repeated unless there is a change in processes or controls.

If employee exposure is at or above the action level, but at or below the PEL, the employer must perform monitoring at least every 6 months and continue until at least two consecutive measurements—taken at least 7 days apart—are below the action level.

If employee exposure is above the PEL, the employer must perform monitoring quarterly and continue until at least two consecutive measurements—taken at least 7 days apart—are at or below the PEL but at or above the action level. The employer then must repeat and continue monitoring every 6 months to bring the exposure to or below the action level as described above.

When there has been a change of equipment, process, control, personnel, or a new task has been initiated that could increase employee lead exposure at or above the action level, the employer must conduct additional monitoring.

The employer must notify each employee in writing of employee exposure assessment results within 5 working days after their receipt. Whenever the results indicate that the representative employee exposure, without the use of respirators, is at or above the PEL, the employer must include a written notice stating that the employee's exposure was at or above that level and describing the corrective action taken or to be taken to reduce exposure to below that level.

The employer must provide affected employees or their designated representatives an opportunity to observe any monitoring of employee lead exposure. The employer must provide the observer with and ensure the use of respirators and protective clothing and equipment when monitoring requires entry into an area where they are necessary. The observer, who must comply with all applicable safety and health procedures, is entitled to receive an explanation of the measurement procedures, observe all steps related to lead-monitoring performed at the place of exposure, and record the results obtained or receive copies of the results when returned by the laboratory.

Medical Surveillance and Multiple Physicians' Review

Employers must make available, at no cost to the employee, initial medical surveillance for employees occupationally exposed to lead at or above the action level for more than 1 day per year. For employees with exposure more than 30 days per year and who have a blood lead level over 40 µg/dl, full medical surveillance is required. All medical exams must be performed by or under the supervision of a licensed physician. In addition, full medical examinations with extensive testing must be made available to those employees exposed at or above the action level for more than 30 days per year.

Initial medical surveillance must include biological monitoring in the form of blood sampling and analysis for lead or zinc protoporphyrin levels. Biological monitoring tests must be conducted in an OSHA-approved lab and be accurate (to a confidence level of 95 percent) within plus or minus 15 percent, or 6 µg/dl, whichever is greater. The tests must be performed as follows:

- at least every 2 months for the first 6 months and every 6 months thereafter for employees exposed at or above the action level for more than 30 days annually;
- at least every 2 months for employees whose last blood sampling and analysis indicated a blood lead level at or above 40 µg/dl; and
- at least monthly during the removal period for each employee removed from exposure due to an elevated blood lead level.

Within 5 days of receiving biological monitoring results, the employer must notify each employee, in writing, of his/her blood lead levels. Employees whose blood lead levels exceed 50 µg/dl must be removed temporarily with medical removal protection benefits, such as pay, seniority, and other rights.

When the results of a blood lead level test indicate the level exceeds the criteria for medical removal, the employer must provide a second (followup) blood sampling test within 2 weeks after receiving initial test results to confirm that removal is necessary.

Under certain limited circumstances, special drugs called chelating agents may be administered to remove circulating blood lead. Using chelation as a preventive measure—that is, to lower blood level but continue to expose a worker—is prohibited and therapeutic or diagnostic chelations of lead that are required must be done under the supervision of a licensed physician in a clinical setting. The employee must be notified in writing prior to treatment.

The employer must make available medical exams to employees exposed at or above the action level for more than 30 days per year as follows:

- at least annually for each employee whose blood lead level within the past 12 months was at or above 40 µg/dl;
- when the employee has developed signs or symptoms commonly associated with lead intoxication;
- when the employee is pregnant; and
- when medically appropriate for employees removed from lead exposure due to a sustained health risk or following a final medical determination.

Medical exams must include the following information:

- detailed work and medical histories, with particular attention to past lead exposure (occupational and nonoccupational), personal habits (smoking and hygiene), and past gastrointestinal, hematologic, renal, cardiovascular, reproductive, and neurological problems;
- a thorough physical exam, with particular attention to gums, teeth, hematologic, gastrointestinal, renal, cardiovascular, and neurological systems; evaluation of lung function if respirators are used;
- a blood pressure measurement;
- a blood sample and analysis to determine blood lead level; hemoglobin and hematocrit determinations, red cell indices, and an exam of peripheral smear morphology; zinc protoporphyrin; blood urea nitrogen; and serum creatinine;
- a routine urinalysis with microscopic exam; and
- any lab or other test the examining physician deems necessary.

The employer must provide all examining physicians with a copy of the lead in construction standard, a description of the affected employee's duties, the employee's lead exposure level, a description of personal protective equipment used, prior blood lead determinations, and all prior written medical opinions for the employee.

The employee must receive written medical opinions from each examining or consulting physician that contain the following:

- opinions regarding any detected medical condition that could place the employee at an increased health risk from lead exposure;
- recommendations for special protective measures or limitations on the employee's exposure;
- limitations on the employee's use of respirators; and
- results of all prior blood lead determinations.

The examining physician must not reveal to the employer either by written or oral opinion any findings unrelated to the employee's occupational exposure to lead. The physician must advise the employee of **any** medical condition (occupational or nonoccupational) that requires further medical attention.

If the employer selects the initial physician to conduct medical exams or consultation, the employee may designate a second physician to review the findings of the first physician and to conduct exams, consultations, and tests as the second physician deems necessary. The employer must promptly notify each employee of the right to seek a second medical opinion following each medical exam or consultation conducted by the initial physician.

Until the employee (1) informs the employer of his/her intent to seek a second medical opinion and (2) initiates steps to make an appointment with a second physician (within 15 days after receipt of notification or receipt of the initial physician's written opinion), the employer may condition his/her participation in and payment for the multiple physician review mechanism. If the findings of the second physician differ from those of the initial physician, the employee and employer must work together to see that the two physicians resolve any disagreement. If no agreement is feasible, the employer and employee may designate a third physician to review findings and conduct exams, tests, and consultations to resolve the disagreement. The employer must act on the third physician's recommendations unless the employer and employee reach agreement consistent with those of at least one of the three physicians.

Medical Removal Protection

Employers must remove employees with lead exposure at or above the action level each time:

- a periodic and followup blood sampling test indicates a blood lead level at or above 50 µg/dl; and
- a final medical determination⁴ indicates a detected medical condition that increases health risks from lead exposure.

Employers must return employees to their former job status when:

- two consecutive blood sampling tests indicate a blood lead level is at or below 40 µg/dl for employees removed due to a blood lead level at or above 50 µg/dl; and
- a subsequent final medical determination indicates there is no longer a detected medical condition that increases health risks from lead exposure.

The employer must remove any limitations placed on employees or end any special protective measures when a subsequent final medical determination indicates they are no longer necessary.

When the multiple physicians' review mechanism has not yet resulted in a final medical determination, the employer must:

- remove employees from lead exposure, provide special protective measures, or place limitations on employees; or
- return employees to their former job status; end special protective measures; and remove limitations **except** when the initial removal, special protection, or limitation resulted from a medical determination different from the finding of the initial physician, or when the employee has been on removal status for the preceding 18 months due to an elevated blood lead level and must await final medical determination.

The employer must provide up to 18 months of medical removal protection benefits each time an employee is removed from lead exposure. As long as the position/job exists, the employer must maintain the earnings, seniority, and other employment rights and benefits as though the employee had not been removed from the lead exposure. The employer may condition medical removal

⁴Refers to the written medical opinion on the employee's health status or the outcome of the multiple physician review mechanism.

protection benefits on the employee's participation in followup medical surveillance.

If a removed employee files a worker's compensation claim for a lead-related disability, the employer must continue medical removal protection benefits pending the disposition of the claim. The employer's obligation will be reduced to the extent that the employee received compensation for earnings lost during removal either from a publicly or employer-funded compensation program or from employment with another employer during the employee's removal.

Information and Training

The employer must inform employees about lead hazards according to the requirement of OSHA's Hazard Communication standard for the construction industry, 29 CFR 1926.59, including—but not limited to—the requirements for warning signs and labels, material safety data sheets (MSDSs), and employee information and training.

For example, the following warning signs must be posted in each work area where employee exposure to lead is above the PEL:

WARNING
LEAD WORK AREA
POISON
NO SMOKING OR EATING

All signs must be well lit and kept clean so that they are easily visible. *Statements that contradict or detract from the signs' meaning are prohibited.* Signs required by other statutes, regulations, or ordinances, however, may be posted in addition to, or in combination with, this sign.

The employer must institute a training program and ensure participation by all employees subject to exposure to lead or lead compounds at or above the action level on any day. Initial training must be provided prior to initial job assignment or the startup date for this requirement, whichever comes last. Training must be repeated at least annually and must include the following:

- the content of the standard and its appendices;
- the specific nature of operations that could lead to lead exposure above the action level;

- the purpose, proper selection, fit, use, and limitations of respirators;
- the purpose and a description of the medical surveillance program, and the medical removal protection program;
- the engineering and work practice controls associated with employees' job assignments;
- the contents of the compliance plan in effect;
- instructions to employees that chelating agents must not be used routinely to remove lead from their bodies and when necessary only under medical supervision; and
- the right to access records under "Access to Employee Exposure and Medical Records," 29 CFR 1910.20.

All materials relating to the training program and a copy of the standard must be made readily available to all employees.

Methods of Compliance

Compliance Program

Prior to each job where employee exposure exceeds the PEL, the employer must establish and implement a written compliance program to reduce employee exposure to the PEL or below. The compliance program must provide for frequent and regular inspections of job sites, materials, and equipment by a competent person.⁵ Written programs, which must be revised and updated at least every 6 months, must include the following:

- a description of each activity in which lead is emitted (e.g., equipment used, material involved, controls in place, crew size, employee job responsibilities, operating procedures, and maintenance practices);
- specific plans to achieve compliance and engineering plans and studies where engineering controls are required;
- information on the technology considered to meet the PEL;
- air monitoring data that document the source of lead emissions;
- a detailed schedule for implementing the program, including copies of documentation (e.g., purchase orders for equipment, construction contracts);

⁵A competent person is one who can identify existing and predictable lead hazards in the surroundings or working conditions that are hazardous or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate those hazards.

- a work practice program including regulations for the use of protective work clothing and equipment and housekeeping and hygiene facility guidelines;
- an administrative control schedule for job rotation, if used;
- a description of arrangements made among contractors on multi-contractor sites to inform affected employees of potential exposure to lead and their responsibility to comply with this standard; and
- any other relevant information.

Engineering, Work Practice, and Administrative Controls

The lead in construction standard requires employers to use—when feasible—engineering, work practice, and administrative controls to reduce and maintain employee lead exposure to or below the PEL. When all feasible controls have been instituted but are not sufficient to reduce employee exposure to or below the PEL, they must be used to reduce exposure to the lowest feasible level and supplemented by respirators.

Engineering controls reduce employee exposure in the workplace either by removing or isolating the hazard or isolating the worker from exposure through the use of technology. Under the lead in construction standard, mechanical ventilation may be used to control lead exposure. If used, the employer must evaluate, as necessary, the mechanical performance of the system in controlling exposure to maintain its effectiveness.

Work practice controls reduce the likelihood of exposure by altering the manner in which a task is performed. Safe work practices under the lead in construction standard include but are not limited to maintaining separate hygiene facilities (i.e., change rooms, showers, hand washing facilities, and lunch areas) and requiring proper housekeeping practices (i.e., cleanup methods).

Housekeeping

All surfaces must be maintained as free as practicable of accumulations of lead. Compressed air must **not** be used to cleanup floors and other surfaces where lead accumulates unless it is used in conjunction with a ventilation system designed to capture the airborne dust created by the

compressed air. Shoveling, dry or wet sweeping, and brushing must be used **only** where vacuuming and other equally effective methods have been tried and found to be ineffective.

Vacuums must be equipped with high-efficiency particulate air (HEPA) filters and used and emptied in a manner that minimizes the reentry of lead into the workplace.

Hygiene Facilities and Practices

Food, beverages, tobacco products, and cosmetics are prohibited in all areas where employees are exposed to lead above the PEL regardless of respirator use.

Employers must provide clean change areas and hand washing and shower facilities, where feasible, for employees who work in areas where airborne exposure to lead is above the PEL regardless of respirator use, or as interim protection (except for showers) for employees performing tasks specified in the "Assessing Exposures" section of this publication. Change areas must be equipped with separate storage facilities for protective work clothing and equipment and for street clothes to prevent cross-contamination. Shower facilities must contain an adequate supply of cleansing agents and towels for those employees required to shower. Employees required to shower must not leave the workplace wearing any protective clothing or equipment worn during the work shift.

Where showers are not provided by the employer, employees must wash their hands and face at the end of the workshift. The employer must provide adequate handwashing facilities—including an adequate supply of water, soap, and clean towels—for employees.

Employers also must provide lunchroom facilities or eating areas for employees who work in areas where their airborne exposure to lead is above the PEL regardless of respirator use. These facilities must be as free as practicable from lead contamination and be easily accessible to all employees. Employees must wash their hands and face prior to eating, drinking, smoking or applying cosmetics in eating

areas. In addition, employees are prohibited from entering these areas when wearing personal protective clothing or equipment unless surface lead dust has been removed by vacuuming, downdraft booth, or other cleaning method.

Administrative Controls can be used to reduce employee exposure by removing the employee from the hazard (i.e., job rotation). If administrative controls are used to reduce employee exposure to lead, the employer must establish and implement a job rotation schedule. The program must identify by name or number each affected employee; specify the duration and exposure level at each job or work station where each affected employee is located; and include other information useful to assess the reliability of administrative controls to reduce employee lead exposures.

Respirators

The employer must provide respiratory protection, at no cost to the employee, and must ensure its use when:

- employee exposure to lead exceeds the PEL;
- engineering and work practice controls are not sufficient to reduce exposure levels to or below the PEL;
- an employee requests a respirator; and
- as interim protection for employees performing the tasks listed under the "Assessing Exposures" section of this publication and section (d)(2) of the standard.

An appropriate respirator, which has been approved by the Mine Safety and Health Administration (MSHA) and NIOSH must be selected to protect against lead dust, fumes, and mists. (See the table for recommended respiratory protection.)

Respirators issued to employees must exhibit minimum facepiece leakage and fit the employee properly. Employers must perform either quantitative or qualitative (for half-mask respirators only) face fit tests at the time of initial fitting and at least every 6 months for each employee wearing a negative-pressure respirator. If the employee shows signs of breathing difficulty during the fit test or during use, the employer must make available an examination in accordance with the medical surveillance requirements of the standard.

Respiratory Protection for Lead Aerosols

Airborne Concentration of Lead or Condition of Use	Required Respirator [*]
Not in excess of 500 µg/m ³	Half-mask air-purifying respirator with high-efficiency filters. ^{*,***} Half-mask supplied-air respirator operated in demand (negative-pressure) mode.
Not in excess of 1,250 µg/m ³	Loose fitting hood or helmet powered air-purifying respirator with high-efficiency filters. ^{***} Hoods or helmet supplied-air respirator operated in continuous-flow mode—for example, type CE abrasive blasting respirators operated in a continuous-flow mode.
Not in excess of 2,500 µg/m ³	Full-facepiece air-purifying respirator with high-efficiency filters. ^{***} Tight-fitting powered air-purifying respirator with high-efficiency filters. ^{***} Full-facepiece supplied-air respirator operated in demand mode. Half-mask or full-facepiece supplied-air respirator operated in continuous-flow mode. Full-facepiece self-contained breathing apparatus (SCBA) operated in demand mode.
Not in excess of 50,000 µg/m ³	Half-mask supplied-air respirator operated in pressure-demand or other positive-pressure mode.
Not in excess of 100,000 µg/m ³	Full-facepiece supplied-air respirator operated in pressure-demand or other positive-pressure mode—for example, type CE abrasive blasting respirators operated in a positive-pressure mode.
Greater than 100,000 µg/m ³ , unknown concentration, or firefighting	Full-facepiece SCBA operated in pressure-demand or other positive-pressure mode.

Source: "Lead Exposure in Construction; Interim Final Rule," *Federal Register* 58(84):26630, May 4, 1993.

^{*}Respirators specified for higher concentrations can be used at lower concentrations of lead.

^{**}Full facepiece is required if the lead aerosols cause eye or skin irritation at the use concentrations.

^{***}A high-efficiency particulate air filter means a filter that is 99.97 percent efficient against particles of 0.3 micron or larger.

Employees who use filter respirators must be permitted to change the filter elements whenever an increase in breathing resistance is detected and must be allowed to leave work areas to wash their faces and respirator facepieces whenever necessary to prevent skin irritation associated with respirator use.

A respiratory protection program is required in accordance with 29 CFR 1910.134.

Protective Clothing and Equipment

The employer must provide at no cost to the employee and ensure the proper use of personal protective equipment where employees are exposed to lead above the PEL, are exposed to lead compounds that may cause skin or eye irritation, or as interim protection for employees performing tasks specified in the “Assessing Exposures” section of this publication—regardless of respirator use. Appropriate personal protective work clothing and equipment, which prevent contamination of employees and their garments, include but are not limited to coveralls or full-body work clothing; gloves, hats, and shoes or disposable coverlets; and face shields, vented goggles, or other appropriate protective equipment that complies with 29 CFR 1910.133.

The employer is required to provide clean and dry protective clothing at least weekly, and daily to employees whose exposure levels—regardless of respirator use—are above 200 $\mu\text{g}/\text{m}^3$ of lead as an 8-hour TWA.

To maintain the effectiveness of the personal protective clothing and equipment, the employer must

- clean, launder, or dispose of contaminated protective clothing;
- repair or replace torn or defective clothing or equipment; and
- ensure all protective clothing is removed at the end of the work shift in change areas provided for that purpose.

All contaminated protective clothing and equipment to be cleaned, laundered, or disposed of must be placed in a closed container in the change area to prevent dispersion of lead outside the container. Blowing, shaking, or otherwise dispersing lead into the air is **prohibited** for removing lead from contaminated materials. Containers of contaminated personal protective clothing and equipment must be labelled as follows:

CAUTION: CLOTHING CONTAMINATED WITH LEAD. DO NOT REMOVE DUST BY BLOWING OR SHAKING. DISPOSE OF LEAD-CONTAMINATED WASH WATER IN ACCORDANCE WITH APPLICABLE LOCAL, STATE, OR FEDERAL REGULATIONS.

The employer also must inform, in writing, any person who cleans or launders the protective clothing or equipment of the potentially harmful effects of lead exposure.

Recordkeeping

The employer must establish and maintain an accurate record of all monitoring and other data used to conduct employee exposure assessments as required by this standard and in accordance with provisions in 29 CFR 1910.120. The following must be included in **exposure assessment** records:

- the dates, number, duration, location, and results of each sample taken, including a description of the sampling procedure used to determine representative employee exposure;
- a description of the sampling and analytical methods used and evidence of their accuracy;
- the type of respiratory protection worn, if any;
- the name, social security number, and job classification of the monitored employee and all others whose exposure the measurement represents; and
- environmental variables that could affect the measurement of employee exposure.

The employer must maintain an accurate record for each employee subject to **medical surveillance**, including:

- the name, social security number, and description of the employee's duties;
- a copy of the physician's written opinions;
- the results, as supplied to the examining physician, of any airborne exposure monitoring done for the representative employee and all others represented; and
- any employee medical complaints related to lead exposure.

In addition, the employer must keep or ensure that the examining physician keeps the following **medical records**:

- a copy of the medical examination results including medical and work history;
- a description of the laboratory procedures and a copy of any guidelines used to interpret the test results; and
- a copy of the results of biological monitoring.

The employer must maintain—for at least the duration of employment—an accurate record for each employee subject to **medical removal**, including:

- the name and social security number of the employee;
- the date on each occasion that the employee was removed from current lead exposure and the corresponding date which the employee was returned to former job status;
- a brief explanation of how each removal was or is being accomplished; and
- a statement about each removal indicating whether the reason for removal was an elevated blood level.

The employer must maintain a record of any objective data relied on to determine initial exposure if it was used in lieu of exposure monitoring for exposure assessment purposes.

The employer must make all records—including exposure monitoring, medical removal, and medical records—available upon request to affected employees, former employees, and their designated representatives and to the OSHA Assistant Secretary and the Director of NIOSH for examination and copying in accordance with 29 CFR 1910.20.

When an employer ceases to do business, the successor employer must receive and retain all required records. If no successor is available, these records must be sent to the Director of NIOSH.

Other Sources of OSHA Assistance

Safety and Health Management Guidelines

Effective management of worker safety and health protection is a decisive factor in reducing the extent and severity of work-related injuries and illnesses and their related costs. To assist employers and employees in developing effective safety and health programs, OSHA published recommended *Safety and Health Management*

Guidelines (January 26, 1989, 54 FR:3908-3916). These voluntary guidelines apply to all places of employment covered by OSHA.

The guidelines identify four general elements critical to the development of a successful safety and health management program:

- management commitment and employee involvement,
- work site analysis,
- hazard prevention and control, and
- safety and health training.

The guidelines recommend specific actions, under each of these general elements, to achieve an effective safety and health program.

State Programs

The Occupational Safety and Health Act of 1970 encourages states to develop and operate their own job safety and health plans. OSHA approves and monitors these plans. There are currently 25 state plan states—23 of these states administer plans covering both private and public (state and local government) employment; the other 2 states, Connecticut and New York, cover the public sector only.

The 25 states and territories with their own OSHA-approved occupational safety and health plans must adopt standards identical to, or at least as effective as, the federal standards. Until a state standard is promulgated, OSHA will provide interim enforcement assistance, as appropriate, in these states. A listing of states with approved plans appears at the end of this booklet.

Consultation Services

Consultation assistance is available on request to employers who want help in establishing and maintaining a safe and healthful workplace. Largely funded by OSHA, the service is provided at no cost to the employer. Primarily developed for smaller employers with more hazardous operations, the consultation service is delivered by state government agencies or universities employing professional safety consultants and health consultants. Comprehensive assistance includes an appraisal of all mechanical, physical work practices, environmental hazards of the workplace, and all aspects of the

employer's present job safety and health program. No penalties are proposed or citation issued for hazards identified by the consultant.

Voluntary Protection Programs (VPPs)

Voluntary protection programs and onsite consultation services, when coupled with an effective enforcement program, expand worker protection to help meet the goals of the OSH Act. The three VPPs—Star, Merit, and Demonstration—are designed to recognize outstanding achievement by companies that have successfully incorporated comprehensive safety and health programs into their total management system. They motivate others to achieve excellent safety and health results in the same outstanding way as they establish a *cooperative relationship* between employers, employees, and OSHA.

For additional information on VPPs and how to apply, contact the OSHA national, regional, or area offices listed at the end of this publication.

Training and Education

OSHA's area offices offer a variety of informational services, such as publications, audiovisual aids, technical advice, and speakers for special engagements. OSHA's Training Institute in Des Plaines, IL, provides basic and advanced courses in safety and health for federal and state compliance officers, state consultants, federal agency personnel, and private sector employers, employees, and their representatives.

OSHA also provides funds to nonprofit organizations, through grants, to conduct workplace training and education in subjects where OSHA believes there is a lack of workplace training. Grants are awarded annually, with a 1-year renewal possible. Grant recipients are expected to contribute 20 percent of the total grant cost.

For more information on grants, training, and education, contact the OSHA Training Institute, Office of Training and Education, 1555 Times Drive, Des Plaines, IL 60018, (708) 297-4810.

For further information on any OSHA program, contact your nearest OSHA regional or area office listed at the end of this publication.

Related OSHA Publications

Single free copies of the following publications can be obtained from the OSHA Publications Office, 200 Constitution Avenue, NW, Washington, DC 20210. Send a self-addressed mailing label with your request.

All About OSHA - OSHA 2056
Chemical Hazard Communication - OSHA 3084
Consultation Services for the Employer - OSHA 3047
Employer Rights and Responsibilities Following an OSHA Inspection - OSHA 3000
OSHA Employee Workplace Rights - OSHA 3021
OSHA Inspections - OSHA 2098
Personal Protective Equipment - OSHA 3077
Respiratory Protection - OSHA 3079

The following publications are available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402, (202) 783-3238, FAX (202) 512-2250. Include GPO Order No. and make checks payable to Superintendent of Documents.

Construction Industry Digest (OSHA 2202)
Order No. 029-016-00128-0; cost \$1.75.

Hazard Communication—A Compliance Kit (OSHA 3104)
(A reference guide to step-by-step requirements for compliance with the OSHA standard.)
Order No. 929-022-00000-9; cost \$1.00.

Hazard Communication Guidelines for Compliance (OSHA 3111)
Order No. 029-016-00127-1; cost \$1.00.

Training Requirements in OSHA Standards and Training Guidelines (OSHA 2254)
Order No. 029-016-00137-9; cost \$4.25.

States with Approved Plans

COMMISSIONER

Alaska Department of Labor
1111 West 8th Street
Room 306
Juneau, AK 99801
(907) 465-2700

DIRECTOR

Industrial Commission of Arizona
800 W. Washington
Phoenix, AZ 85007
(602) 542-5795

DIRECTOR

California Department
of Industrial Relations
455 Golden Gate Avenue
4th Floor
San Francisco, CA 94102
(415) 703-4590

COMMISSIONER

Connecticut Department
of Labor
200 Folly Brook Boulevard
Wethersfield, CT 06109
(203) 566-5123

DIRECTOR

Hawaii Department of Labor
and Industrial Relations
830 Punchbowl Street
Honolulu, HI 96813
(808) 586-8844

COMMISSIONER

Indiana Department of Labor
State Office Building
402 West Washington Street
Room W195
Indianapolis, IN 46204
(317) 232-2378

COMMISSIONER

Iowa Division of Labor Services
1000 E. Grand Avenue
Des Moines, IA 50319
(515) 281-3447

SECRETARY

Kentucky Labor Cabinet
1049 U.S. Highway, 127 South
Frankfort, KY 40601
(502) 564-3070

COMMISSIONER

Maryland Division of Labor
and Industry
Department of Licensing
and Regulation
501 St. Paul Place, 2nd Floor
Baltimore, MD 21202-2272
(410) 333-4179

DIRECTOR

Michigan Department of Labor
Victor Office Center
201 N. Washington Square
P.O. Box 30015
Lansing, MI 48933
(517) 373-9600

DIRECTOR

Michigan Department of Public
Health
3423 North Logan Street
Box 30195
Lansing, MI 48909
(517) 335-8022

COMMISSIONER

Minnesota Department of Labor
and Industry
443 Lafayette Road
St. Paul, MN 55155
(612) 296-2342

DIRECTOR
Nevada Department of Industrial
Relations
Capitol Complex
1370 S. Curry Street
Carson City, NV 89710
(702) 687-3032

SECRETARY
New Mexico Environmental
Department
Occupational Health and Safety
Bureau
1190 St. Francis Drive
P.O. Box 26110
Santa Fe, NM 87502
(505) 827-2850

COMMISSIONER
New York Department of Labor
State Office Building-Campus 12
Room 457
Albany, NY 12240
(518) 457-2741

COMMISSIONER
North Carolina Department
of Labor
4 West Edenton Street
Raleigh, NC 27601
(919) 733-0360

ADMINISTRATOR
Oregon Occupational Safety
and Health Division
Oregon Department of Insurance
and Finance, Room 160
21 Labor and Industries Building
350 Winter Street, NE
Salem, OR 97310
(503) 378-3272

SECRETARY
Puerto Rico Dept. of Labor
and Human Resources
Prudencio Rivera Martinez
Building
505 Munoz Rivera Avenue
Hato Rey, PR 00918
(809) 754-2119

COMMISSIONER
South Carolina Department
of Labor
3600 Forest Drive
P.O. Box 11329
Columbia, SC 29211-1329
(803) 734-9594

COMMISSIONER
Tennessee Department of Labor
501 Union Building
Suite "A" - 2nd Floor
Nashville, TN 37243-0655
(615) 741-2582

CHAIRMAN
Utah Industrial Commission
160 East 300 South, 3rd Floor
P.O. Box 146600
Salt Lake City, UT 84110-6600
(801) 530-6880

COMMISSIONER
Vermont Department of Labor
and Industry
120 State Street
Montpelier, VT 05620
(802) 828-2288

COMMISSIONER
Virgin Islands Department
of Labor
2131 Hospital Street
Christiansted
St. Croix, VI 00840-4666
(809) 773-1994

COMMISSIONER
Virginia Department of Labor
and Industry
Powers-Taylor Building
13 South 13th Street
Richmond, VA 23219
(804) 786-2376

DIRECTOR
Washington Department
of Labor and Industries
General Administration Building
P.O. Box 44001
Olympia, WA 98504-4001
(206) 956-4213

ADMINISTRATOR
Occupational Safety and Health
Administration
Herschler Bldg. 2nd Floor East
122 West 25th Street
Cheyenne, WY 82002
(307) 777-7672

OSHA Consultation Project Directory

State	Telephone
Alabama	(205) 348-3033
Alaska	(907) 269-4939
Arizona	(602) 542-5795
Arkansas	(501) 682-4522
California	(415) 703-4441
Colorado	(303) 491-6151
Connecticut	(203) 566-4550
Delaware	(302) 577-3908
District of Columbia	(202) 576-6339
Florida	(904) 488-3044
Georgia	(404) 894-8274
Guam	(671) 646-9244
Hawaii	(808) 586-9116
Idaho	(208) 385-3283
Illinois	(312) 814-2337
Indiana	(317) 232-2688
Iowa	(515) 281-5352
Kansas	(913) 296-4386
Kentucky	(502) 564-6895
Louisiana	(504) 342-9601
Maine	(207) 289-6460
Maryland	(410) 333-4218
Massachusetts	(617) 969-7717
Michigan	(517) 335-8250(H)
.....	(517) 322-1809(S)
Minnesota	(612) 297-2393
Mississippi	(601) 987-3981
Missouri	(314) 751-3403
Montana	(406) 444-6418
Nebraska	(402) 471-4717
Nevada	(702) 486-5016
New Hampshire	(603) 271-6155
New Jersey	(609) 292-3923
New Mexico	(505) 827-2877
New York	(518) 457-2481
North Carolina	(919) 733-3949
North Dakota	(701) 221-5188
Ohio	(614) 644-2631

State Telephone

Oklahoma	(405) 528-1500
Oregon	(503) 378-3272
Pennsylvania	(412) 357-2561
Puerto Rico	(809) 754-2171
Rhode Island	(401) 277-2438
South Carolina	(803) 734-9599
South Dakota	(605) 688-4101
Tennessee	(615) 741-7036
Texas	(512) 440-3834
Utah	(801) 530-6868
Vermont	(802) 828-2765
Virginia	(804) 786-6613
Virgin Islands	(809) 772-1315
Washington	(206) 956-5443
West Virginia	(304) 558-7890
Wisconsin	(608) 266-8579(H)
.....	(608) 266-1818(S)
Wyoming	(307) 777-7786

(H) - Health

(S) - Safety

OSHA Area Offices

Area	Telephone
Albany, NY	(518) 464-6742
Albuquerque, NM	(505) 766-3411
Allentown, PA	(215) 776-0592
Anchorage, AK	(907) 271-5152
Appleton, WI	(414) 734-4521
Augusta, ME	(207) 622-8417
Austin, TX	(512) 482-5783
Avenel, NJ	(908) 750-3270
Baltimore, MD	(410) 962-2840
Baton Rouge, LA	(504) 389-0474
Bayside, NY	(718) 279-9060
Bellevue, WA	(206) 553-7520
Billings, MT	(406) 657-6649
Birmingham, AL	(205) 731-1534
Bismarck, ND	(701) 250-4521
Boise, ID	(208) 334-1867
Bowmansville, NY	(716) 684-3891
Braintree, MA	(617) 565-6924
Bridgeport, CT	(203) 579-5579
Calumet City, IL	(708) 891-3800
Carson City, NV	(702) 885-6963
Charleston, WV	(304) 347-5937
Cincinnati, OH	(513) 841-4132
Cleveland, OH	(216) 522-3818
Columbia, SC	(803) 765-5904
Columbus, OH	(614) 469-5582
Concord, NH	(603) 225-1629
Corpus Christi, TX	(512) 888-3257
Dallas, TX	(214) 320-2400
Denver, CO	(303) 844-5285
Des Plaines, IL	(708) 803-4800
Des Moines, IA	(515) 284-4794
Englewood, CO	(303) 843-4500
Erie, PA	(814) 833-5758
Fort Lauderdale, FL	(305) 424-0242
Fort Worth, TX	(817) 885-7025
Frankfort, KY	(502) 227-7024
Harrisburg, PA	(717) 782-3902
Hartford, CT	(203) 240-3152
Hasbrouck Heights, NJ	(201) 288-1700
Hato Rey, PR	(809) 766-5457
Honolulu, HI	(808) 541-2685

Area	Telephone
Houston, TX	(713) 286-0583
Houston, TX	(713) 591-2438
Indianapolis, IN	(317) 226-7290
Jackson, MS	(601) 965-4606
Jacksonville, FL	(904) 232-2895
Kansas City, MO	(816) 483-9531
Lansing, MI	(517) 377-1892
Little Rock, AR	(501) 324-6291
Lubbock, TX	(806) 743-7681
Madison, WI	(608) 264-5388
Marlton, NJ	(609) 757-5181
Methuen, MA	(617) 565-8110
Milwaukee, WI	(414) 297-3315
Minneapolis, MN	(612) 348-1994
Mobile, AL	(205) 441-6131
Nashville, TN	(615) 781-5423
New York, NY	(212) 264-9840
Norfolk, VA	(804) 441-3820
North Aurora, IL	(708) 896-8700
Oklahoma City, OK	(405) 231-5351
Omaha, NE	(402) 221-3182
Parsippany, NJ	(201) 263-1003
Peoria, IL	(309) 671-7033
Philadelphia, PA	(215) 597-4955
Phoenix, AZ	(602) 640-2007
Pittsburgh, PA	(412) 644-2903
Portland, OR	(503) 326-2251
Providence, RI	(401) 528-4669
Raleigh, NC	(919) 856-4770
Salt Lake City, UT	(801) 486-8405
San Francisco, CA	(415) 744-712
Savannah, GA	(912) 652-4393
Smyrna, GA	(404) 984-8700
Springfield, MA	(413) 785-0123
St. Louis, MO	(314) 425-4249
Syracuse, NY	(315) 451-0808
Tampa, FL	(813) 626-1177
Tarrytown, NY	(914) 682-6153
Toledo, OH	(419) 259-7542
Tucker, GA	(404) 493-6644
Westbury, NY	(516) 334-3344
Wichita, KS	(316) 269-6644
Wilkes-Barre, PA	(717) 826-6538

U.S. Department of Labor Occupational Safety and Health Administration Regional Offices

Region I
(CT,* MA, ME, NH, RI, VT*)
133 Portland Street
1st Floor
Boston, MA 02114
Telephone: (617) 565-7164

Region II
(NJ, NY,* PR,* VI*)
201 Varick Street
Room 670
New York, NY 10014
Telephone: (212) 337-2378

Region III
(DC, DE, MD,* PA, VA,* WV)
Gateway Building, Suite 2100
3535 Market Street
Philadelphia, PA 19104
Telephone: (215) 596-1201

Region IV
(AL, FL, GA, KY,* MS, NC,* SC,* TN*)
1375 Peachtree Street, N.E.
Suite 587
Atlanta, GA 30367
Telephone: (404) 347-3573

Region V
(IL, IN,* MI,* MN,* OH, WI)
230 South Dearborn Street
Room 3244
Chicago, IL 60604
Telephone: (312) 353-2220

Region VI
(AR, LA, NM,* OK, TX)
525 Griffin Street
Room 602
Dallas, TX 75202
Telephone: (214) 767-4731

Region VII
(IA,* KS, MO, NE)
911 Walnut Street, Room 406
Kansas City, MO 64106
Telephone: (816) 426-5861

Region VIII
(CO, MT, ND, SD, UT,* WY*)
Federal Building, Room 1576
1961 Stout Street
Denver, CO 80294
Telephone: (303) 844-3061

Region IX
(American Samoa, AZ,* CA,* Guam, HI,* NV,* Trust Territories of the Pacific)
71 Stevenson Street
Room 415
San Francisco, CA 94105
Telephone: (415) 744-6670

Region X
(AK,* ID, OR,* WA*)
1111 Third Avenue
Suite 715
Seattle, WA 98101-3212
Telephone: (206) 553-5930

*These states and territories operate their own OSHA-approved job safety and health programs (Connecticut and New York plans cover public employees only). States with approved programs must have a standard that is identical to, or at least as effective as, the federal standard.